LA-UR-17-28773
Approved for public release; distribution is unlimited.

Title:	Special Event Analysis
Author(s):	Syracuse, Ellen Marie
Intended for:	Printed/online handout
Issued:	2018-02-01 (rev.1)

Special Event Analysis

Seismoacoustics Team, EES-17 seismoacoustics@lanl.gov

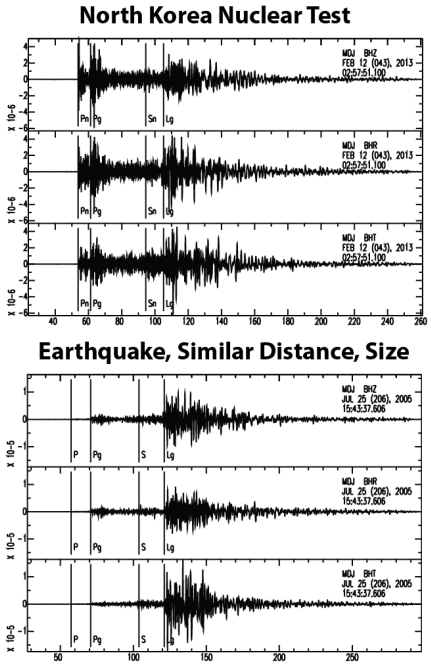
The LANL Seismoacoustics Team includes expertise on the geophysical tools required to rapidly analyze seismic events of interest using a variety of phenomenologies. This analysis focuses on answering the following questions:

What was it?

· Build a catalog of background events in the region, with or without information on prior events, using a range of signal detection techniques

· Exploit additional types of data to determine nature of the event

· Determine if event of interest is distinct from background (natural or anthropogenic) activity



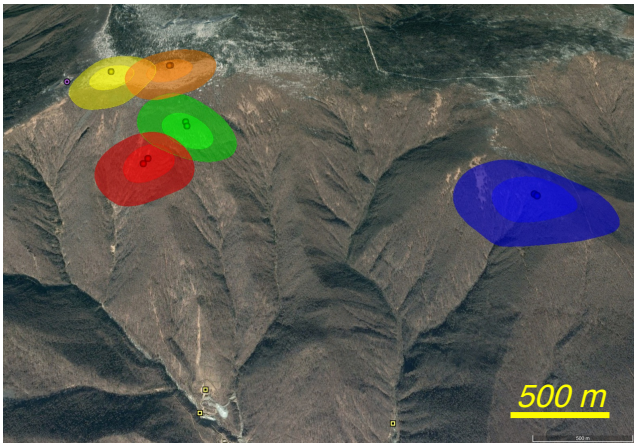
A comparison showing the distinct waveforms for the 2013 DPRK nuclear test and an earthquake of a similar size and distance, recorded at the same station

Where was it?

· Seismic absolute or relative location and associated uncertainties

· Event location and associated uncertainties, based on multiple data types such as seismic, infrasound, or electro-magnetic signals

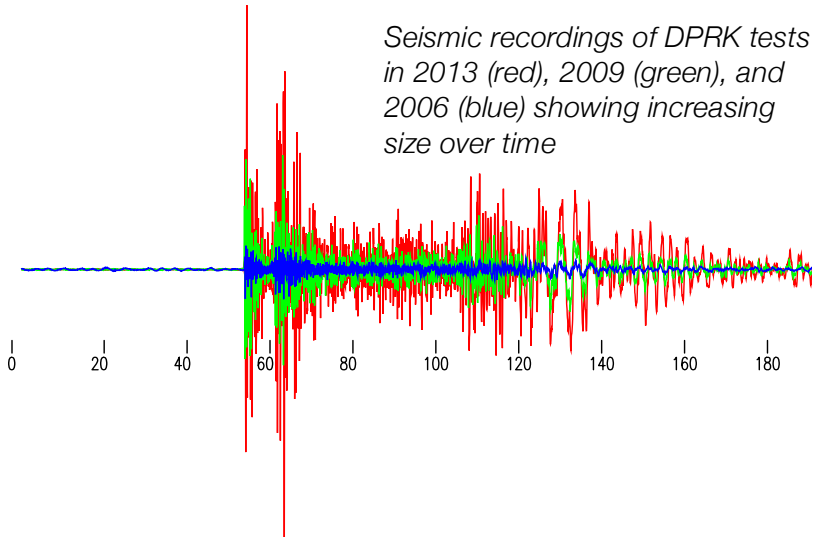
· Sophisticated propagation model building to further enhance location accuracy



Locations and associated uncertainty ellipses of five reported DPRK nuclear tests, 2006-2016.

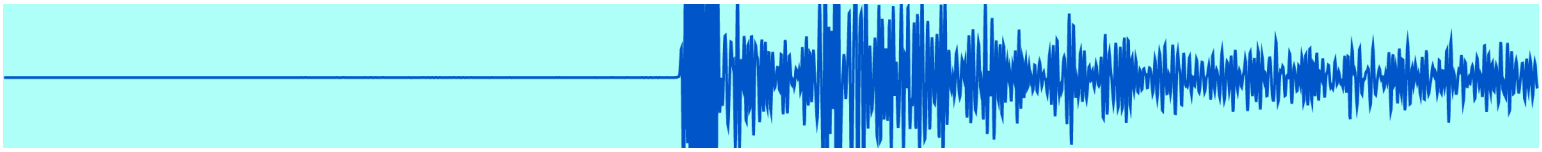
How big was it?

· Amplitude- and spectral-based techniques for both absolute and relative magnitudes and yields



Seismic recordings of DPRK tests in 2013 (red), 2009 (green), and 2006 (blue) showing increasing size over time

Los Alamos NATIONAL LABORATORY EST. 1943



Special Event Analysis Team Members

Michael Begnaud mbegnaud@lanl.gov, 505-667-7620

Phillip Blom pblom@lanl.gov, 505-665-0052

Joshua Carmichael joshuac@lanl.gov, 505-667-5724

K. Michael Cleveland mcleveland@lanl.gov, 505-667-1511

Garrett Euler ggeuler@lanl.gov, 505-667-1446

Jonathan MacCarthy jkmacc@lanl.gov, 505-665-4448

Omar Marcillo omarcillo@lanl.gov, 505-606-0192

W. Scott Phillips wsp@lanl.gov, 505-667-8106

Charlotte Rowe char@lanl.gov, 505-665-6404

Richard Stead stead@lanl.gov, 505-665-1033

Ellen Syracuse syracuse@lanl.gov, 505-667-2269

Recent Publications

Arrowsmith, S., **G. Euler, O. Marcillo, P. Blom,** R. Whitaker, G. Randall (2015), Development of a robust and automated infrasound event catalogue using the International Monitoring System, *Geophys. J. Int*., 200, 1411-1422, doi:10.1093/gji/ggu486.

Carmichael, J., R. Nemzek, S. Arrowsmith, K. Sentz (2016), Fusing geophysical signatures of locally recorded surface explosions to improve blast detection, *Geopyhs. J. Int*., 204, 1838-1842, doi:10.1093/gji/ggw006.

Carmichael, J. (2016), A waveform detector that targets template-decorrelated signals and achieves its predicted performance, Part I: Demonstration with IMS data, *Bull. Seismol. Soc. Am*., 106, 1998-2012, doi:10.1785/0120160047.

Cleveland, K. M., T. F. VanDeMark, C. J. Ammon (2015), Precise relative locations for earthquakes in the northeast Pacific region, *J. Geophys. Res*., 120, doi:10.1002/2015JB012161.

Cleveland, K. M., C. J. Ammon (2015), Precise relative earthquake magnitudes from cross correlation, *Bull. Seismol. Soc. Am*., 105, 1792-1796, doi:10.1785/0120140329.

Marcillo, O., S. Arrowsmith, R. Whitaker, **D. Anderson**, A. Nippress, D. N. Green, D. Drob (2014), Using physics-based priors in a Bayesian algorithm to enhance infrasound source location, *Geophys. J. Int*., 196, 375-385, doi:10.1093/gji/ggt353.

LA-UR-17-28773